TENKO 23+

VOLTAGE CHART

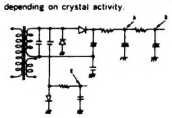
1. All readings taken with VTVM from chassis (negative) to point indicated.
2. Input to transceiver set at 220 volts AC. Similar readings are obtained with 12.6 volts DC input.
3. Transceiver set to channel 13.
4. PA switch in CB position, VOLUME and SQUELCH at minimum (counter-clockwise), FINE TUNING in center (normal) position.
5. 50 ohm dummy load connected to antenna connector.
6. Readings on individual units may vary by as much as ± 20%.

NDV - No detectable voltage. NC - No connection. NM - Not measurable.

TUBE VOLTAGES

TUBE	MODE	PIN 1	2	3	4	5	6	7	8	9
6BL8 V1	TR									
	REC	100	NDV	50	H	H	240	0.8	3.5	NDV
6BL8 V2	TR									
	REC	90	NDV	125	H	H	115	2.3	0	−5 *
6HA6 V3	TR									
	REC	NDV	0	H	H	230	78	0.9		
6HA6 V4	TR									
	REC	NDV	0	H	H	230	65	0.9		
12AX7 V5	TR	90	NDV	H	H	H	90	NDV	0.7	NC
	REC	90	NDV	0.9	H	H	RC	NDV	0.65	NC
6BQ5 V6	TR	NC	NDV	4.7	H	H	NC	250	NC	200
	REC	NC	NDV	5.3	H	H	NC	270	NC	215
6GH8 V7	TR	65	−0.3 *	65	H	H	100	0.06	0	−4.5 *
	REC	70	−0.3 *	70	H	H	115	0.06	0	−5.0 *
6GH8 V8	TR	100	−0.4 *	110	H	H	180	2.0	0	−1.7 *
	REC									
6BA6 V9	TR	NDV	0	H	H	230	80	1.8		
	REC									
6BQ5 V10	TR	NC	−15 *	2.0	H	H	NC	NM	NC	223
	REC									
12AT7 V11	TR	100	NDV	0	H	H	100	NDV	0	
	R C	110	NDV	0	H	H	110	NDV	0	

* Measured with 1 megohm resistor in series with DC probe. Reading may vary at grid pins, depending on crystal activity.



Point	TR	REC
A	255 V	269 V
B	197 V	218 V
C	−94 V	−117 V

MODULATION ADJUSTMENT

Connect a modulation monitor to the transceiver. Connect the shield lead of an audio generator to a ground point on the transceiver. Connect the "hot" center lead of the generator in series with a .05 mfd condenser to pin 1 of the microphone jack. Set generator frequency to 1KHz and adjust same to 40 mv. output. Adjust VR4 to produce 80% modulation. To recheck the adjustment of VR4, adjust the generator output (5mv) so that the modulation monitor indicates 50%.

NOTE: Following the above steps will produce 100% modulation on speech. In no case shall modulation exceed 100%.

CRYSTAL FREQUENCY CHART

The following chart indicates which two crystal frequencies are used for each of the 23 channels.

	23.290 MHz	23.340 MHz	23.390 MHz	23.440 MHz	23.490 MHz	23.540 MHz
14.950 MHz						
14.960 MHz						
14.970 MHz						
14.990 MHz						

TV INTERFERENCE TRAP

This transceiver contains a built-in adjustable network in series with the antenna. When tuned correctly, it suppresses television interference. This network is a filter which offers little opposition to the transmitter frequency but will help eliminate the second harmonic radiation.

Turn on a TV receiver that you can see from your transmitting location, and tune to one of the three lower TV channels that has a station operating in your vacinity. If you notice a "cross-hatch" or "wavy line" pattern on the screen while you are transmitting, it will be necessary to adjust the RF network coil slug screw (L1) in rear of cabinet, to eliminate or minimize this interference. This will usually only be necessary when the transmitter antenna is located near the TV antenna, or that of a neighbor.

LOCAL OSCILLATOR

The master local oscillator, V7B, is crystal-controlled and is used during both transmit and receive. A normally functioning oscillator will develop approximately 4.5 volts at pin 9 of V7B (see voltage charge). Differences in individual crystal activity will cause a variation in the voltage measured at this point.

A local oscillator is tuned as follows: adjust the bottom core of L7 for maximum negative reading at pin 9 of V7B with the channel selector switch set to channel 23, then back off from peak in a clockwise direction to about 70% of the maximum reading. Check all channels for activity. A defective crystal will produce zero voltage at pin 9 in four consecutive channels.

After this adjustment has been made, check transmitter output frequency to make sure it is within FCC specification on all channels. Readjust L7 if necessary.

SYNTHESIZER, 2nd LOCAL OSCILLATOR

The synthesizer (V11B) is used during both transmit and receive. A normally functioning oscillator will develop approximately 0.3 volts at V7A pin 2 (see voltage chart), depending upon crystal activity. The output from V7A and the output from V7B produce a 38 MHz output at the plate circuit of V11B, T9 being tuned to the frequency.

RF ADJUSTMENTS

When it has been ascertained that all oscillators are functioning normally, connect the signal generator (modulated 30% at 1KHz) to the antenna connector. Use RG58 U or equivalent 52 ohm cable. Set generator output to approximately 10 uV, and switch receiver to channel 13. Tune the generator around 27.115 MHz until a signal is heard in the receiver. Adjust the generator output frequency for maximum output voltage reading on the VTVM (at speaker terminals). Adjust the top and bottom tuning cores of T1 for maximum output.

"S" METER ADJUSTMENT

After receiver alignment has been completed, adjust VR1 for a "S-9" reading on the "S" meter with 100uV at the antenna input and transceiver set to channel 13.

TRANSMITTER ALIGNMENT

The details of operation and alignment of the local oscillator and synthesizer has been covered previously. Both oscillators are used for the transmit operation.

In the receive mode, B+ is removed from V8 and V9 and a large bias is applied to the grid of the RF power output tube V10. In the transmit mode, B+ is removed from V1, V2, V3 and V4 in the receiver and applied to V8 and V9 in the transmitter. The bias formerly applied to V10 is removed.

NOTE: Connect a 50 OHM dummy load to antenna connector before proceeding (use two 100 ohm 2 watt resistors in parallel).

Connect VTVM (with AC probe) to pin 1 of V9. With mike button pressed, adjust T10 for maximum reading on channel 13. A reading of approximately 1.4 volts is normal. Failure to obtain any reading may indicate trouble in the 11.275 MHz converter stage. If the receiver is normal, it is likely that the trouble lies beyond T9, in which case V8 or the 11.275 MHz crystal should be suspected. After this adjustment has been made, check transmitter output frequency to make sure it is within FCC specification on all channels. Readjust L6 if necessary.

Connect VTVM (with series resistor) to pin 2 of V10. Adjust T5 for maximum reading on channel 13. A reading of approximately 15 volts is normal. At this point, check all channels with an RF wattmeter connected to the antenna connector. Make sure that there is approximately equal power output on all channels. If output is low on some channels, slightly re-adjust T5 for equal reading on all channels.

MAXIMUM RF OUTPUT

CV5 (Load) and CV4 (Plate) should now be adjusted for maximum power output on the RF wattmeter. Adjustment of CV4 and CV5 affects the power input to the final amplifier. Remember, maximum RF input power has been set at 5 watts by the FCC. Power input may be determined as follows: Check the voltage across resistor R79 (1K, 2W) - it should not exceed 19 volts. This figure has been arrived at on the basis of an average of 223 volts on the plate with 19 mA plate current. 223 × 0.019 = 4.24 watts.

If the voltage measured across R79 is higher than 19 volts, set CV5 fully clockwise and then peak CV4 for maximum. Now adjust CV5 clockwise until reading of 19 volts is measured across R79.

RECEIVER ALIGNMENT

455 KHz IF ADJUSTMENT

Connect the transceiver to a power source and attach the microphone. Turn volume to its mid-position squelch at minimum and the PA switch in the CB position. Set FINE TUNING to the mid-position (normal) and the CHANNEL selector to channel 13.

Connect an AC voltmeter (VTVM) across the speaker terminals in the transceiver. Alternatively, the meter can be connected to the "Phone" jack by means of a standard phone plug.

Connect a 455 KHz signal generator (modulated 30% at 1KHz) to pin 8 of V2 (6BL8). Make certain the output frequency of the generator is within 1 KHz of 455 KHz. Increase generator output until the VTVM reads approximately 0.5 volts.

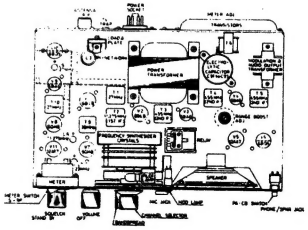
Adjust the top and bottom tuning cores of T3, T4 and T5 for maximum output. Reduce generator output progressively as circuits come into line so that VTVM reading does not exceed about 0.5 volts. When no further increase can be obtained by adjusting the cores, disconnect the signal generator and proceed with the 11.275 MHz IF adjustments.

11.275 MHz IF ADJUSTMENT

Connect the signal generator to pin 9 of V1 (6BL8), with the VTVM connected to the speaker terminals. Make sure the Fine Tuning control is in the normal, center position. Tune the generator in the vicinity of 11.275 MHz until a maximum reading is obtained on the VTVM. Reduce generator output level until the meter reads about 0.5 volts. Adjust top and bottom cores of T2 for maximum reading, reducing generator output if necessary so that reading does not exceed 0.5 volts.

SECOND OSCILLATOR

The second oscillator V2B (6BL8) is crystal-controlled. The Fine Tuning control permits fine tuning of the receiver and has a total range of about 2.5KHz. A normally functioning oscillator will develop approximately −1.5 to −8 volts at pin 9 of V2B. Differences in individual crystal activity will cause a variation in grid voltage for crystal to crystal.



SIMPLE TROUBLE SHOOTING

TUBES

Tubes may be checked in a do-it-yourself tube tester in a neighborhood store, or may be taken to a service shop for testing. Replace any weak or defective tubes with new ones of identical type. Before replacing tubes in the transceiver, refer to the diagram (on a following page) which shows the correct tube location.

SOLID-STATE DC POWER SUPPLY

This transceiver employs a solid-state (2-transistor) power supply circuit during 12 volts DC operation (no vibrator is used). The transistors, which are located on the rear panel, have been treated with a light protective coating to avoid possible oxidation. Under no circumstances should the transistors be allowed to come into contact with the vehicle chassis, metal brackets, etc. This will cause a short-circuit and may destroy the transistors.

PILOT LAMPS

There are two pilot lamps used in the transceiver. One of these is built into the meter, and the other provides illumination for the channel dial plate. Both are run considerably below their maximum rating and should therefore last almost indefinitely.

FUSES

The 12-volt DC power cable uses an "in-line" fuse. The value of this fuse is 8 amp. Provision has also been made for fusing the primary circuit during 117 volt AC operation by means of a 2 amp fuse located within the transceiver (remove bottom cover for access to the fuse).

In the event of complete failure (tube filaments and pilot lamps not lighting), the fuse should always be checked first. If it has failed, replace only with one of a similar rating. Repeated failure of a fuse would indicate a serious fault in the transceiver which should be investigated.

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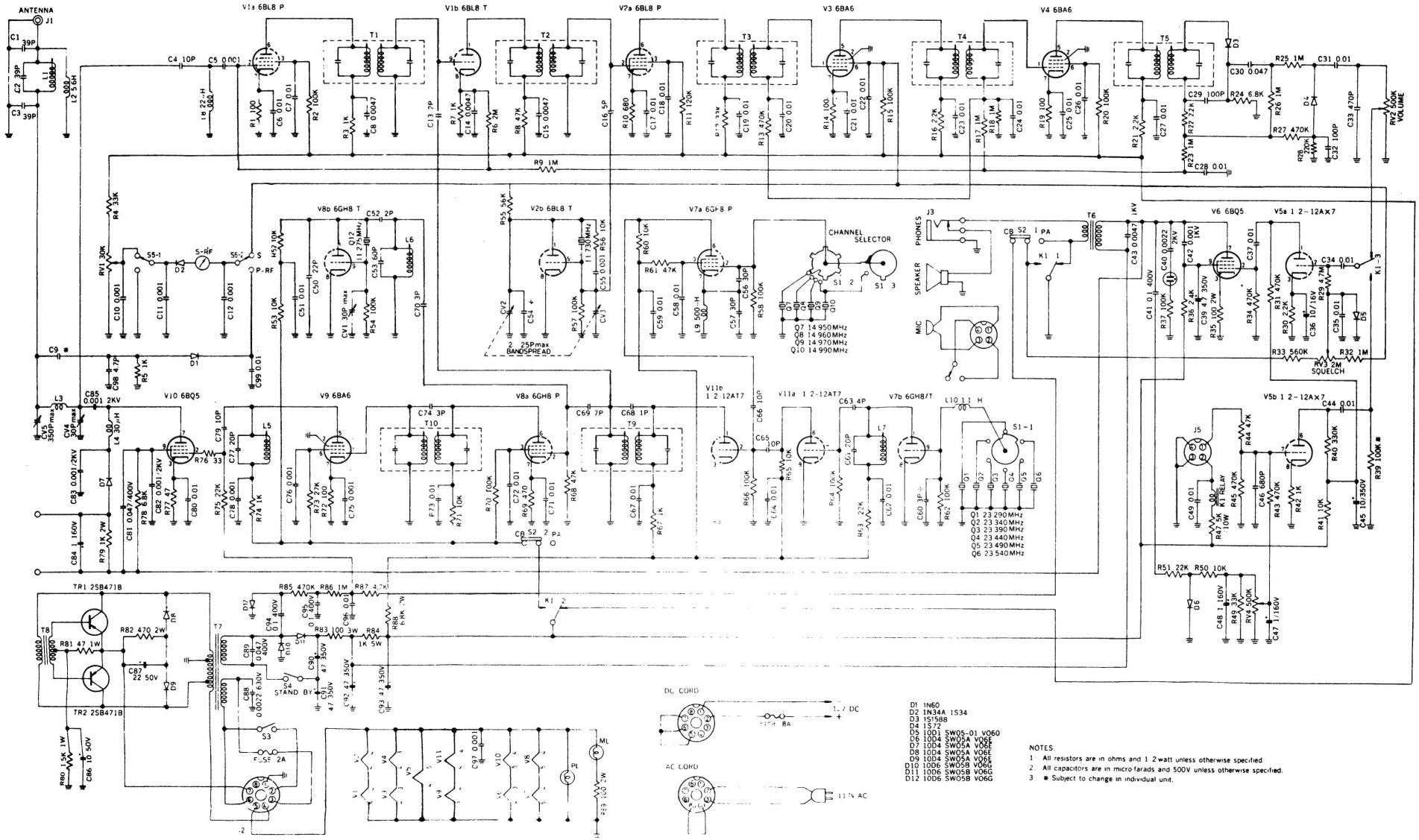

D1 1N60
D2 1N34A 1S34
D3 1S1588
D4 1S72
D5 10D1 SW05-01 VO60
D6 10D4 SW05A VO6E
D7 10D4 SW05A VO6E
D8 10D4 SW05A VO6E
D9 10D4 SW05A VO6E
D10 10D6 SW05B VO6G
D11 10D6 SW05B VO6G
D12 10D6 SW05B VO6G

NOTES
1. All resistors are in ohms and 1/2 watt unless otherwise specified.
2. All capacitors are in micro-farads and 500V unless otherwise specified.
3. * Subject to change in individual unit.